Before the
Federal Communications Commission
Washington, D.C. 20554

Draft KDB Publication 987594

U-NII 6 GHz Devices Operating in the
5.925–7.125 GHz Band

COMMENTS OF
THE NATIONAL ASSOCIATION OF BROADCASTERS

I. INTRODUCTION AND SUMMARY

The National Association of Broadcasters (NAB)[1] hereby submits the following initial comments in response to the FCC Office of Engineering and Technology Laboratory Division's draft publication regarding unlicensed devices that will operate in the 6 GHz band.[2]

NAB appreciates the opportunity to comment on OET's preliminary guidance, as well as the effort being undertaken to include input from licensed incumbent users of spectrum to be shared with unlicensed users. NAB's comments are limited to the need to protect licensed 6 GHz mobile users from interference in uncoordinated (non-AFC) settings.

As a general matter, we hope OET will seek further comment on a revised Knowledge Database publication (KDB) that reflects input it receives from licensed stakeholders to ensure the final test procedure is adequate to ensure U-NII equipment is unlikely to cause interference to incumbent mobile services operating in portions of the 6 GHz band. In

---

[1] The National Association of Broadcasters (NAB) is the nonprofit trade association that advocates on behalf of free local radio and television stations and broadcast networks before Congress, the Federal Communications Commission and other federal agencies, and the courts.

[2] FCC Office of Engineering and Technology Laboratory Division Public Draft Review, U-NII 6 GHz devices operating in the 5.925–7.125 GHz band, Publication 987594, published August 14, 2020 (Draft 6 GHz KDB).

addition, we hope OET will not finalize the KDB test procedure until primary users of the spectrum to be shared with U-NII have reasonable assurance that marketed U-NII devices will reliably detect their operations.

Our comments address two issues in more detail below. First, in permitting unlicensed operations in the 6 GHz band, the FCC mandated the use of a contention-based protocol (CBP) but did not adopt a specific technology or define the requirements for such a protocol. Therefore, OET's choice of CBP requirements for purposes of equipment authorization must not reflect a specific technology choice and must reflect the Commission's assurance "that licensed incumbent operations in the band are protected from harmful interference and continue to deliver the high value services on which Americans rely."[3] Second, OET must not allow equipment into the U.S. market that has a high probability of disrupting licensed services. NAB proposes a specific energy detection threshold that will adequately protect most indoor mobile operations at 6 GHz and urges OET to adopt that value or a lesser one, at least until the Commission and stakeholders are able to evaluate real-world experience with unlicensed operations in the 6 GHz band.

II. THE FCC'S 6 GHZ ORDER REQUIRES A CBP WITH ENERGY DETECTION BUT THE PROPOSED DETECTION THRESHOLD IS ARBITRARY

The device types involved in this proceeding include Low-Power Indoor Access Points (LPI), Subordinates, and Indoor Clients. As noted in the Draft 6 GHz KDB, "these devices must use a contention-based protocol (CBP) such as "listen before talk" that provides interference

[3] *Unlicensed Use of the 6 GHz Band*, Report and Order, 35 FCC Rcd 3852, ¶1 (2020) (6 GHz Report and Order).

protection for incumbent services."[4] NAB is concerned that the CBP testing requirements described in the draft KDB will prove inadequate to protect incumbent services.

The Draft U-NII 6 GHz KDB proposes that LPI Access Points, Subordinates, and Indoor-only client devices demonstrate compliance with a CBP as part of the EMC Test Report.[5] The CBP must ensure incumbent co-channel operations are detected in a technology-agnostic manner by using energy detection and avoid simultaneous transmission. Specifically, the Draft U-NII 6 GHz KDB proposes that "unlicensed indoor low-power devices must detect co-channel radio frequency power that is at least -62 dBm or lower. Upon detection of energy in the band, unlicensed low power indoor devices must vacate the channel and stay off the channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm). The -62 dBm (or lower) threshold is referenced to a 0 dBi antenna gain."[6]

NAB appreciates that the proposed CBP test procedure requires that the protocol be technology-agnostic and specifically recognizes DVB/OFDM transmissions as one type of incumbent signal that must be detected. DVB/OFDM transmissions are commonly employed by Electronic Newsgathering (ENG) systems at 6 GHz.[7] We further agree that a 10 MHz bandwidth is appropriate for many present ENG uses, though we note that other greater or lesser bandwidths may be employed based on the specific deployment and may change as ENG systems evolve.

NAB is concerned, however, that the proposed -62 dBm detection threshold will not be sufficient to reliably detect ENG systems. Specifically, the proposed threshold will not protect

---

[4] Draft 6 GHz KDB at 6.

[5] *Id*. at 8, 13, and 15.

[6] *Id*. at 21-22.

[7] *Id*. at 22.

ENG systems used indoors. In its order authorizing unlicensed operations in the 6 GHz band, the Commission specifically recognized that indoor ENG systems are uniquely susceptible to interference.[8] The Commission noted that a study submitted by Apple, Broadcom, *et al*. showed that a contention-based protocol with a threshold of -62 dBm would be sufficient to allow unlicensed devices operating in the House of Representatives Main Chamber ("House Chamber") to sense ENG operations and avoid co-channel conflicts.[9] We emphasize that this study and the associated conclusion are limited to a specific equipment layout in a single, specific location, the House Chamber, which is a relatively small indoor space of about 90 x 136 feet (the ceiling height is ignored).[10] The Commission should not extrapolate this conclusion to *all* indoor operations.

Many indoor venues where ENG systems are used, including most sports venues, are considerably larger than the House Chamber. For example, the main interior space of the Capital One Center in Washington, DC is about 490 x 365 feet (again, the ceiling height is ignored for simplicity of analysis). The difference in size between the House Chamber and most indoor sports venues has a substantial impact on the results of an interference simulation because the separation distance between an ENG camera and its associated receiver will be much greater in a larger venue. We urge OET not to arbitrarily adopt a detection threshold that would unduly constrain the operation of existing licensed ENG systems in larger venues.

---

[8] 6 GHz Report and Order at ¶168.

[9] *Id*.

[10] Letter from Rick Kaplan to Marlene H. Dortch, Attachment at 16, ET Docket No. 18-295 (Dec. 5, 2019).

III. THE REQUIRED DETECTION THRESHOLD SHOULD BE -75 DBM OR LESS FOR DETECTION OF INDOOR ENG SYSTEMS

The Draft 6 GHz KDB specifies that to ensure incumbent operations are reliably detected, low-power indoor devices must detect RF energy throughout their intended operating channel. For example, an 802.11 device that plans to transmit a 40 MHz-wide signal (on a primary 20 MHz channel and a secondary 20 MHz channel) must detect energy throughout the entire 40 MHz channel. Additionally, indoor low-power devices must detect co-channel energy with 90 percent or greater certainty.[11]

A typical portable ENG camera transmits at a radiated power (EIRP) level of about 50–250 mW. At the lower EIRP, detection at -62 dBm would be limited to a distance of about 33 meters (108 feet) under free-space conditions. At the higher EIRP, detection at -62 dBm would be limited to about 73 meters (240 feet). In the House Chamber example discussed above, the largest distance separation (worst case, ignoring ceiling height) between an ENG camera and its receiver is about 163 feet.[12] Thus, detection at -62 dBm in the House Chamber depends on the power level of the ENG camera at the worst-case separation distance.

To determine whether detection at a threshold of -62 dBm is "likely" or "unlikely" in the general case, meaning that the probability that a randomly placed arrangement of ENG transmitters and LPI APs would result in a calculated (free-space) signal level above or below -62 dBm, we first calculate the typical distance between two points inside a rectangular box, representing a flat version of an indoor space. The typical distance between two randomly placed points inside a rectangular box is the so-called "expectation" distance $<E_{RECTANGLE}>$. In

---

[11] Draft U-NII 6 GHz KDB, p. 22

[12] $\sqrt{90^2 + 136^2}$

the House Chamber, that typical distance is about 60 feet.[13] Thus, under typical conditions, the -62 dBm detection threshold will generally be adequate to detect an ENG camera, even operating at low power in an interior space the size of the House Chamber.

In contrast, a typical sports venue, such as the Capital One Arena in Washington DC, is much larger. The largest distance separation (again ignoring ceiling height) between an ENG camera and its receiver is about 611 feet and the "typical" distance between them is about 224 feet. Thus, in the Arena, the low-power portable camera would likely *not* be detected by an LPI Access Point in most locations because the 224-foot typical separation distance is greater than the 108-foot detection limit. Even at high-power, the 224-foot typical separation distance is very close to the 240-foot detection limit. For the typical separation distance, the margin of a low-power camera below the proposed detection threshold of -62 dBm is 6.4 dB, while it is over 15 dB in the worst case. It is therefore very likely that LPI Access Points with a detection threshold of -62 dBm will fail to detect ENG signals in typical indoor sports venues and will thus cause interference to licensed ENG systems in those locations unless the detection threshold is reduced.

Typical application of portable cameras is covering courtside or ice-side action, where the distance from the playing surface to a RLAN device (and the associated ENG receiving antennas) may be on the order of 500 feet, or more. At that distance, a portable ENG camera

---

[13] Johan Philip, "The Probability Distribution of the Distance Between Two Random Points in a Box," gives this relationship where a and b are the dimensions of the walls:

$$\langle E_{RECTANGLE} \rangle = \frac{a^2}{6b}\ln\left(\frac{b}{a}+\sqrt{1+\frac{b^2}{a^2}}\right)+\frac{b^2}{6a}\ln\left(\frac{a}{b}+\sqrt{1+\frac{a^2}{b^2}}\right)+\frac{1}{15}\left(\frac{b^3}{a^2}+\frac{a^3}{b^2}+\left(3-\frac{a^2}{b^2}-\frac{b^2}{a^2}\right)\sqrt{a^2+b^2}\right)$$

See:
http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.579.1175&rep=rep1&type=pdf

would produce a signal level of -75.3 dBm. Thus, a detection threshold of about -75 dBm or less is required in order to reasonably ensure that co-channel incumbent ENG operations are not disrupted by U-NII device transmissions.[14]

IV. CONCLUSION

As NAB has noted several times in its docket comments, the near-term situation at 6 GHz is strikingly similar to the long-existing situation at 2.4 GHz. The decades-old contention-based protocol used by most Wi-Fi systems, CSMA/CA, has been ineffective in eliminating or avoiding interference to BAS Channels A8 and A9, which share spectrum with 2.4 GHz unlicensed systems. As a result, those channels are largely unusable by licensed BAS systems. This is the same CBP that is being proposed in the Draft 6 GHz KDB. OET has an opportunity with a very limited window of time to avoid making hundreds of megahertz of spectrum unusable by licensed incumbents. We urge OET to adopt a CBP with a more robust energy detection requirement at 6 GHz.

Respectfully submitted,

NATIONAL ASSOCIATION OF BROADCASTERS
1 M Street, SE
Washington, DC 20003
(202) 429-5430
s/s

_____
Robert D. Weller, P.E.
Vice-President, Spectrum Policy

September 23, 2020

[14] We note that in the adjacent 5 GHz bands, ETSI BRAN 301 893 (v.21.40, July 2020) proposes detection threshold levels of -85 dBm/MHz for some Access Points, which is equivalent to -75 dBm in a bandwidth of 10 MHz.